

A NEW Approach to Defining and Measuring Creativity: Rethinking Technology & Creativity in the 21st Century

By Punya Mishra, Danah Henriksen & the Deep-Play Research Group,
Michigan State University

“Creativity to me is just like... poof... it’s like a bird, like a friendly bird that embraces all... ideas, and just like shoots, out of its eyes all kinds of beauty.” “Wow Lemon, this is like watching Hemmingway write... Mark Hemmingway.”

- Conversation between characters, Liz Lemon & Jack Donaghy in the television show 30 Rock.

“Every line is the perfect length if you don’t measure it.” – Marty Rubin

Justice Potter Stewart of the Supreme Court when attempting to define pornography famously said: “I know it when I see it.” This definition (or acknowledgement of the difficulty of constructing a definition) is similar to the way we often think about creativity. The idea that creativity defies definition, and yet is recognizable, speaks to the ineffable yet self-evident magic that seems to underlie the creative spark. As creativity becomes an important part of education, however, it is imperative that we move beyond such generalizations towards a more precise definition. Such a definition would provide multiple benefits. First, it would allow us to develop a shared understanding of this important construct, and second, we could, given this shared understanding, begin to develop more precise evaluations of it. These twin goals (of definition and evaluation) are important as we think about the role of creativity in teaching and learning.

Over the past few issues of this journal, we have been exploring the importance of creativity in 21st century learning from a variety of perspectives: as framed by the imperatives of technology (Mishra & the Deep-Play Research Group, 2012), 21st cen-

tury learning environments (Mishra, Fahnoe, & Henriksen, 2013), and the trans-disciplinary nature of knowledge in STEM and other disciplines (Mishra, Henriksen, & the Deep-Play Research Group; Mishra, Terry, Henriksen, & the Deep-Play Research Group, 2013; Mishra, Yadav, & the Deep-Play Research Group, 2013). What we haven’t done, however, is define (as precisely as possible given the complexity of the term) what it is that we mean when we say that something is creative (be it an idea or an artifact or a solution to a problem). We have assumed that we are all speaking in the same terms when we use the word “creativity” and that we all agree on how we assess something as being creative. Of course, our assumption is just that, a presupposition that may be not grounded in reality.

Thus, in this paper we seek to provide a definition of creativity, and in turn offer an example of an ongoing research project in which this definition is being used to develop rubrics for evaluating the products of the creative process.

A Problem of Definition

Creativity has long been recognized as a powerful force in shaping

human society and driving progress and knowledge. As Victor Hugo once noted, “An invasion of armies can be resisted, but not an idea whose time has come.” Yet, for all the historical basis of valuing creativity (a basis which stretches back to antiquity, with Plato’s concept of “the Muse”) the emphasis on creativity has never been as pressing, or as academically discussed, as it is in present day. Many authors have noted how the complexities of knowledge and technology in our modern world have heightened the need for creative thinkers (Florida, 2002; Pink 2005). Educational scholars such as Cropley (2003), Sternberg (2007; 2008), Robinson (2003), and Sawyer (2011), among many others, have focused on the importance of creative thinking in the field of education. We have concurred with these ideas and, in prior writings, suggested that the creative imperative for education has never been more important than it is today; both in domains that have traditionally been viewed as “creative” such as the arts, but just as much in areas such as science, technology, engineering and mathematics (Mishra, Terry, Henriksen, & the Deep-Play Research Group, 2013; Mishra, Yadav, & the Deep-Play Research Group, 2013).

Yet despite this renewed interest in creativity, researchers and theorists alike have struggled to concretely define the construct, thus lacking agreement on *what* it is and *how* it should be defined (Baker, Rudd, & Pomeroy, 2001; Friedel & Rudd, 2005; Marksberry, 1963; Sternberg, 1999). For example, in an investigation of more than 90 articles from top peer-reviewed journals, all dealing specifically with the topic of creativity, Plucker, Beghetto, & Dow (2004) determined that only 38% of these articles offered an actual definition of the term *creativity*. This lack of a common definition of creativity prevents us from having a shared understanding of the construct. Are different people even talking about the same thing when they say a certain product, idea, or artifact is more or less creative than another? How are we to know?

In order to really understand what creativity means, and how it functions within a discipline such as teaching, it is important to develop a meaningful definition. We offer below a definition by three important indicators or dimensions that underlie creative products. This definition builds on Besemer's (1998) three-factor model for evaluating design creativity. These three definitional indicators are important, because they reveal how creativity can connect broadly with, and be judged within, multiple domains.

What Lies Within: The Components of Creativity

At the most general level, a creative idea or product is **novel**—it brings something into the world that did not exist before (at least in that particular form/arrangement). These novel objects are often described as being *surprising* or *original*. See Table 1 for other synonyms or words related to this dimension of creativity.

Mere novelty, however, does not make something creative. Novelty must be joined to “purpose” or usefulness. As noted musician and bassist Charles Mingus once said, “creativity is about more than just being different. Anybody can play weird, that’s easy.” A novel idea with no poten-

tial use cannot be taken as “creative” (Cropley, 2003). Novelty does not guarantee that something will be **effective** (Amabile, 1989, 1996; Oldham & Cummings, 1996; Zhou & George, 2001). Useful, logical, understandable are some words that are used in connection with this dimension. See Table 1 for some other synonyms or words related to effectiveness.

A range of authors (Besemer, 1998; Besemer & O’Quin, 1999; Sternberg & O’Hara, 1999), suggested that though these two attributes (novelty and effectiveness) are necessary, they are not sufficient. Another key characteristic, according to Sternberg & O’Hara is “task appropriateness,” while according to Besemer (1998) it is what they call “style.” Creative products (ideas, artifacts etc.) are inherently sensitive to the context and to the domain they were created within. For instance, a creatively constructed mathematical proof, or an ingeniously designed science experiment, both look incredibly different; and furthermore they look different from any number of creative acts in fields like music, art, teaching, and so on (Mishra, Henriksen, & the Deep-Play Research Group, 2012). So, a thoroughgoing definition of creativity must also account for this contextual dimension, the *style* of the product, as it were.

As Mishra & Koehler (2008) have noted, “Creative solutions often go beyond mere novelty and functionality to include a strong aesthetic quality. Creative products and solutions are deeply bound to the context within which they occur; they are integrated, organic and whole.” Thus, Mishra & Koehler suggest that “**wholeness**” (which involves the aesthetic dimensions of work, as situated with that work’s specific context) as being a third dimension of identifying creative artifacts. Other words related to this dimension are organic, well-crafted, and elegant (see Table 1 for more related words).

These three independent axes (novel, effective, and whole) provide us with a framework for defining creativity. In other words, creative solutions are *novel*, *effective* and *whole*. Creative products (be they artifacts

or ideas) are not just new or interesting, they are useful, and they have a certain aesthetic sensibility, which is connected to and evaluated within a specific context—the whole! This, serendipitously enough, gives us a new acronym to remember our new definition of creativity. A creative solution is NEW, i.e. it is Novel, Effective and Whole or creativity is a goal driven process of developing solutions that are Novel, Effective and Whole.

Evaluating Creativity in Teaching, Learning, and Other Settings

Evaluations of creative work happen instinctively in the world around us. It is an innately subjective and human activity to observe, interact with, and make judgments about objects or ideas in the manmade world of things. It is important, however, that we go beyond mere subjectivity in evaluating creative artifacts. As Lord William Thomson Kelvin once said, not being able to measure what it is that we are speaking of is a “meager and unsatisfactory” kind of knowledge. For this purpose, the goal of our research team has been to develop a rubric that would allow educators to evaluate the creativity of a given product.

We must distinguish what we are describing here from the more standard psychometric approaches that seek to measure individual creativity. There are numerous psychological measures that attempt to quantify a person’s individual creativity (or psychological capacity for creative thought). For example, the Torrance Test of creativity is one of the more common creativity tests, and is designed as a psychological measurement of an individual’s divergent thinking. Our approach, however, is different in its purpose, in that we focus on the products of creative activity, i.e. we seek to evaluate the end products of creative process. These “end products” may include physical objects, concepts and ideas, or artifacts such as poems and theories. Our focus on artifacts highlights the philosophical proposition that it is *what we do* that matters (not what a test thinks we are).

Our emphasis on the end products of the creative process is driven by

Table 1. from Mishra & Koehler, 2008 (adapted from Besemer & O'Quin, 1999).

Creative solutions are OR Creativity is a goal driven process of developing solutions that are	
Novel	Fresh, unusual, unique, surprising, startling, astonishing, astounding, germinal, trendsetting, radical, revolutionary, influential, pioneering
Effective	Valuable, important, significant, essential, necessary, logical, sensible, relevant, appropriate, adequate, functional, operable, useful, user-friendly
Whole	Organic, ordered, style, arranged, organized, formed, complete, elegant, graceful, charming, attractive, refined, complex, intricate, ornate, interesting, understandable, meaningful, clear, self-explanatory, well crafted, skillful, well made, meticulous

two reasons. The first is that the process of creativity is often invisible to the outsider. What we have, at the end of the day, is what the creative process produces. And *that* is what we seek to evaluate. The second reason involves our focus on actual classroom contexts where educators have to evaluate and pass judgment on student work. Though we value the importance of process, as educators we have to develop better measures and rubrics to speak coherently and systematically about the creative products that students develop. An increased emphasis on open-ended assignments and project based learning makes this task even more important. By putting the spotlight on creative production, we are focusing on work that has tangible validity in a classroom context.

Before we offer the work we have been doing on developing these rubrics, a few caveats may be in order. First, it is important to emphasize that (in accordance with the flexible nature of creativity) any rubric for evaluating creativity must itself be flexible and adaptive. Rubrics or evaluation systems for creativity cannot be narrow, rigid, or too standardized, but rather should provide a flexible guiding structure for thoughtful judgment on the dimensions of creative “quality”. Second, we must also understand that creating such rubrics is fraught with risk in that rubrics can become too abstract and distant from the actual work under consideration and we may end up with metrics that focus on information that is easily available

rather than information that is truly important. In other words, we have to be careful that we keep our focus on measuring what we value rather than the reverse—valuing what we can easily measure.

A NEW measure of creative artifacts

In our work with the Deep-Play Research group in the Michigan State University College of Education, we have been engaged in the development of such a “rubric” (Terry, Henriksen, & Mishra, 2013). We developed this rubric for research purposes, as part of an empirical examination of student creativity in one of our educational technology courses. Student participants in this course, “Creativity in Teaching and Learning”, develop their own artifacts for teaching subject matter. These artifacts, created as a part of this class, range from content related activities to lesson plans, often including some creative way of looking at content, or providing a new and innovative use of digital technologies. The rubric effectively provides evaluation guidelines along three key dimensions: Novelty, Effectiveness and Wholeness. Artifacts are given a score between 1 and 5 for each of these dimensions. The rubric provides definitions at each score point as well as providing examples (or “anchor artifacts”) to provide a sense of what may be expected at each point.

In order to develop this rubric, we began by having two researchers (one

of whom was the second author of this article and the other was an advanced doctoral student) independently going through and familiarizing themselves with each project in the data set. There are over 350 different student generated artifacts in our data-set collected over three different iterations of the course. Once the researchers developed holistic sense of the data, they went on to conduct a preliminary coding of a subset of the projects. This preliminary coding was supported by a series of back-and-forth discussions to develop a shared and consistent understanding of what each score between 1 and 5, along each of the three NEW dimensions, would mean. Once consensus had been reached on the scoring guidelines for the projects/data, we performed an inter-rater reliability test by having the two coders independently code 10% of the projects. There was 87% agreement between the coders.

The rubric itself provides a definition for each score point, and the selection of some “anchor projects” to exemplify the scores (i.e. anchor the coding with examples of what each score might look like). These definitions are relatively brief, and intended to help any coder/scorer understand a verbal description of the scoring, along with the more visual description offered by anchor examples. For instance, a score of “1” for novelty would offer: “Lack of anything unique or novel, and lack of content or substance to even offer opportunities for novelty.” While a score of “5” for

novelty would offer: “Strong qualities of uniqueness, in ways that could be exciting or interesting to learners – is very novel or different from other examples in the data set and shows a relatively very novel approach to teaching of subject matter (in relative terms to other teaching artifacts/projects in the course).” We are currently engaged in rating a whole range of other artifacts (from more current versions of the creativity course) as a test of this rubric and hope to describe our rubric (and the scoring process) in greater detail in other publications /conference presentations in the near future.

In conclusion

In this paper, we provided a NEW (Novel, Effective, Whole) definition of creativity as well as introducing a possible way of using this definition to create a contextual, flexible rubric for evaluating creative products. While this is clearly a work in progress, it is through the use of such emergent and flexible structures for evaluating creativity that we hope to provide a way of measuring creative work in the classroom. We understand that there always will be an element of subjectivity in this process; just as there is subjectivity in any open-ended, complex, artistic or problem-solving work or thinking (Mishra & the Deep-Play Research Group, 2012). It is, however, important to have a structure to guide judgment and give each project or artifact a fair, systematic, consistent and comprehensive assessment. This examination of the meaning and definitional components of creativity, along with our current work in the evaluation of the products of the creative process, is meant to further the broad understanding of the topic and its role in teaching and learning.

Through the development of adaptive creativity evaluation schemas (such as our own example described here), we may offer a gauge for creative work that gives it an important place at the table of teaching. In this era of accountability, where creative approaches are slipping from the scene all too quickly, creative teaching needs all the support it can get.

The Deep-Play Research group at the college of education at Michigan State University includes: Punya Mishra, Danah Henriksen, William Cain, Chris Fahnoe, Kristen Kereluik, Colin Terry, and Laura Terry. Address all communication to Punya Mishra <punya@msu.edu>.

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